Spectroscopic discrimination of shit from Shinola

Painter, T H ; Schaepman, Michael E ; Schweizer, W ; Brazile, J

Abstract: We conducted an experiment to determine whether people can tell shit from Shinola. Shinola is a brand of shoe polish once manufactured in the United States. Today we care about Shinola only because it is part of the slang expression "doesn't know shit from Shinola," meaning "is completely ignorant." Shinola is posited for comparison with shit because the two substances have a similar dark brown color and smeary consistency. The expression now has a special degree of irony. Most people truly do not know shit from Shinola—because they have never heard of Shinola.

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Spectroscopic Discrimination of Shit from Shinola

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Shinola is a brand of shoe polish once manufactured in the United States. Today we care about Shinola only because it is part of the slang expression "doesn't know shit from Shinola," meaning "is completely ignorant." Shinola is posited for comparison with shit because the two substances have a similar dark brown color and smeary consistency.

The expression now has a special degree of irony. Most people truly do not know shit from Shinola—because they have never heard of Shinola.

Figure 1a. Experimental setup for examining Shinola in the lead author's personal laboratory. Air temperatures were 18°C and relative humidity was 23 percent. Moisture measurements near the surface of the sample were intentionally avoided.

Measurements

The spectral reflectance measurements over Shinola and shit were made in the personal laboratory space of the lead author. Samples of Shinola and shit were sampled and exposed as follows.

The shit: The shit sample was obtained from a female dog of age 3.5 years in Boulder, Colorado. The dog enjoys typical nutrition for its breed and dwelling place, and weighs 20.4 kilograms. The sample was best described as a typical "well formed stool" that features a medium consistency, brown color, and typical smell. Its temperature at time of examination was the ambient temperature of 18°C. Moisture was not sampled.

The Shinola: The sampled Shinola ("Cordovan" color) was from a pre-1940s, 19 gram cylindrical aluminum container that had been unused prior to this examination.

We used an Analytical Spectral Devices FR (www.asdi.com) field spectroradiometer to measure the hemispherical-directional reflectance factor (HDRF)[1] at nadir of both targets using standard techniques. In Figures 1a and 1b, we show the experimental setup for measurements over Shinola and shit.

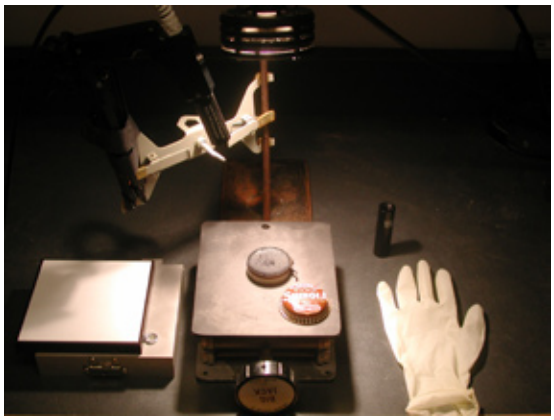

Figure 1b. Experimental setup for examining dog shit.

Final data processing was performed using a polishing method that was designed to be used in the spectral domain.[2] "Spectral polishing" is a term to describe a mathematical renormalization method for removing artifacts from reflectance spectra using only the data itself. It has nothing to do with the function of Shinola.

Results

The HDRF of the shit sample was spatially heterogeneous primarily due to topographic, rather than compositional, differences. The spectral standard deviation had a mean, minimum, and maximum across the spectrum of 2.5×10^{-2}, 9.0×10^{-3}, and 7.0×10^{-2}, respectively in reflectance. The HDRF of Cordovan (brown) Shinola were spatially homogeneous across the smooth surface of the sample (see Figure 2a). The spectral standard deviation had a mean, minimum, and

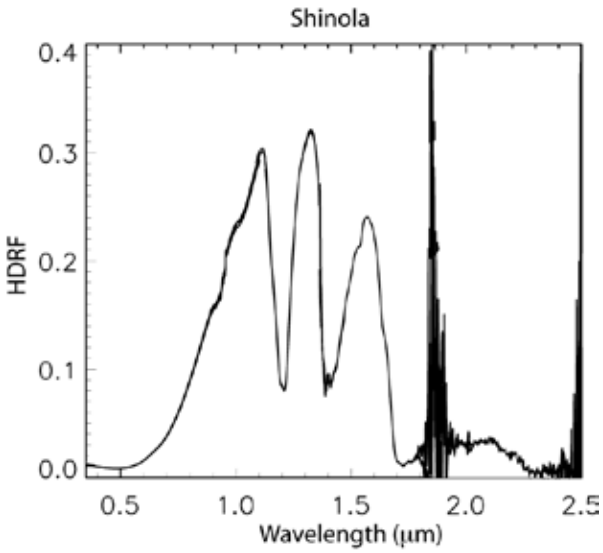

Figure 2a. Measurements of hemispherical-directional reflectance factor (HDRF) of Shinola. The solar zenith angle at time of acquisition was 33° with cloud-free skies.

maximum across the spectrum of 2.0 x 10^{-3}, 2.9 x 10^{-4}, and 1.0 x 10^{-2} (excluding the water vapor absorption at $\lambda \sim 1.9$ μm), respectively in reflectance.

At this point, we get down to finally observationally knowing shit from Shinola. The spectral HDRF of shit exhibits strong absorption in the visible wavelengths (resulting in human visual detection that the shit is brown) and peak reflectance in the wavelength span $1.0 \leq \lambda \leq 1.3$ μm (see Figure 2b). The spectral HDRF of Shinola likewise exhibits strong absorption in the visible wavelengths (again we see it is brown but not that it is necessarily different from shit) but peak reflectance in the broader wavelength range $1.0 \leq \lambda \leq 1.6$ μm. Figure 3 shows the comparative HRDF of shit and of Shinola.

A more precise knowledge of shit from Shinola would come from spectroscopic analysis of constituent absorption. Shit has local absorption features at 1.19 μm and 1.47 μm, whereas Shinola has local absorption features at 1.21 μm, 1.41 μm, and 1.73 μm. The slope of the HDRF of shit is positive from 2.1 to 2.23 μm where as that of Shinola is negative.

Therefore, it is evident that to the human eye, shit and Shinola are inseparable given similar morphology, whereas with near-infrared spectroscopy shit is easily known from Shinola. The work presented here **c**ontributes the first documented methodology for knowing shit f**r**om Shinola and also the first that can do so in near real-time.

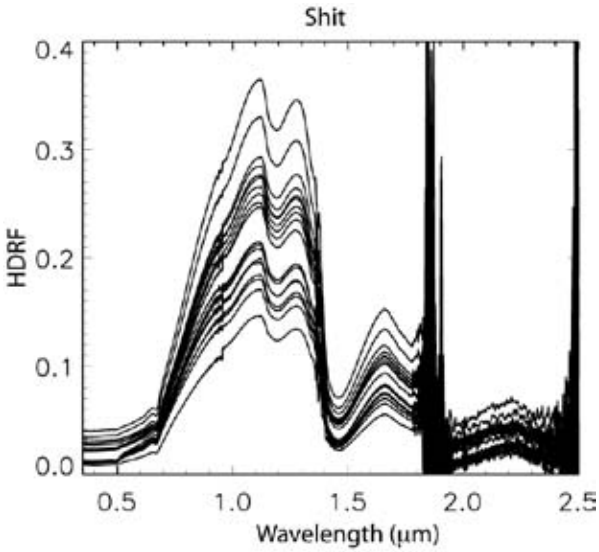

Figure 2b. Measurements of hemispherical-directional reflectance factor (HDRF) of dog shit.

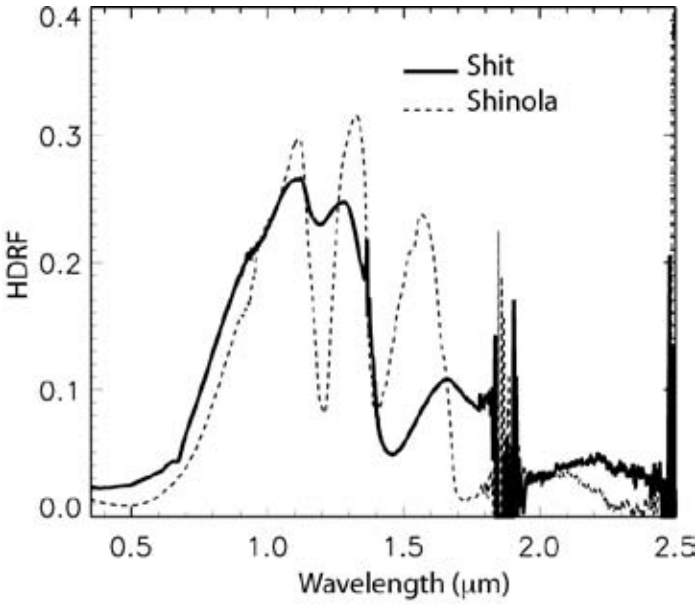

Figure 3: Spectral polished results for Shinola and shit.

Dedication

This work is devoted to the memory of C. Walter Rosenthal.

References

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2. "Post-ATREM Polishing of AVIRIS Apparent Reflectance Data using EFFORT: a Lesson in Accuracy versus Precision," J.W. Boardman, *Summaries of the Seventh JPL Airborne Earth Science Workshop,* JPL Publication 97-21, vol. 1, 1998, p. 53.